



Certamen Mathematicum,^{24.}

O R,

A Mathematicall-Dispute,

Between George Liddell, Student of *Philosophy* and *Mathematicks* into the *Marischall-Colledge* of ABERDEEN:

A N D

James Waterson, (*Mathematicus nomine tenus*) in the Cow-gate of EDINBURGH, at the Sign of the Cross-staff:

Wherein George Liddel undertakes clearly to demonstrate and prove the said James Waterson, to be grossly ignorant into all the *Mathematicall Sciences*.

Scientia non habet Inimicum, nisi Ignorantem.

ABERDEEN,

Printed by JOHN FORBES, Printer to the CITY and UNIVERSITY,

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Epistle to the Candid Reader.

COURTEOUS READER,

I Doubt not, but you may be surprised to find me in Print, and I doe assure you, that it is not more above your Hopes and Expectations, then contrare to my former Designs and Resolutions: For as Atis (who was the son of Cresus,) his dumbness from the Womb, could not keep him from bursting into speech against those Souldiers who he did behold were ready to have killed his Father; even so, my generall insufficiency in all things else, cannot keep my naturall affection in longer silence, especially when I see my Father so abused, by such an impudent, ignorant and pretended Mathematician: according as I have read into the good sayings of the Ancients, No punishment can be thought great enough, for that Child, which should offer violence to his Parents; whom (if there were an occasion offered) he should be ready to defend with the loss of his life.

And now, finding that the Person with whom I have to do, hath given but a very simple and ignorant solution of these five Problems, which were called Tyrocinia Nautica. therefore I judge it both his interest, and my Credit to correct the same by a more full and perfect solution of them: For as the feigned Miracles of the Magicians, found greater credit

Amsterdam.
E. W. 1704.

with

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with the Egyptians, — then the true ones of Moses, Even so a false information having nothing to contradict it, often times prevails (with us) as true.

Not many Years ago my Father was acquainted with a Mathematicall Teacher at Edinburgh, (whose Name was James Cors,) who, for his integrity of Life, and accomodation to Mathematicall Students and Scholer was very well known: He was a Man not given to Opentation, but lived content with the Talent that God had bestowed upon him, in the Mathematicall Sciences, neither did he envy any person, altho their Gifts were above his, and yet he was very well versed in several points of the Mathematicall Sciences, as is evident by his Writtings extant now in Print: but being removed by Death, of him I shall say no more. About this time also there was that Famous, Learned and unparalleled Mathematicall Champion, Mr. James Gregorie, Professor of the Mathematicks in to the Colledge of Edinburgh, who being also removed by Death, and taken from Mortalitie to Immortalitie of Everlasting Happiness, I may therefore ingeniously say, that both City and Colledge were made destitute of two Mathematicall Luminaries. After which time, yea, and of late, there cometh in a Mathematician (from ire tenus) called James Paterson, but from whence I know not: for I am certain he was never brought up, nor educat into any Colledge, and far less in expressing himself in Exotico Idiomate, as some do

narrate unto me; therefore as I judge, he is fitter to be a Collier then a Schollar; and that because thorow an ambitious and proud humour, (quasi nulli secundus) he foolishly carps, rails, and rhymes at every person, and especially against our Printer John Forbes: yea at last he endeavours through his blind ignorance, to hit my Father on the heel, (& merito) if I shall handsomely hit him on the head, and put him to a stupore, when studeuisse had been more proper for him, before that all be done: for which reason, there was published in print (the last Year) five Problems, within the Dialogue, betwixt Paterson and Forbes: and altho they were but Tiocinia Nautica, the fourth whereof a Cabin boy might have easily solved, yet how beastly and ignorantly hath he solved them into his railing and lying Almanack, for the Year 1685, as shall be fully illustrate by these Demonstrations following! I am certainly perswaded that the flatteries of Scorners and Ignorants, have brought him to this height of imaginary Learning, and that (in a sober temper) when he comes to himself, he will thank me for all my Pains.

But to conclude, as in combating, each Party first intends his own Defence, and then in the second place, onely prepares an Assault for his Antagonist, even so, before I make any attempt on my Adversaries foolish solutions, shall endeavour to wipe off that Reproach which James Paterson strives to put upon my Father, in calling him Fool and Ignorant;

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ignorant: for it is very well known that he was a teacher of the Mathematicks at London above eighteen Years together, even untill the Year of his Majesties happy Restauration: and in the year thereafter 1661, was by his Majesties Speciall Command sent down to Scotland to be Professor of the Mathematicks into the Marischall Colledge of Aberdeen, there being a considerable Sallarie Morisified by his own Uncle, Duncan Liddell, Doctor of Medicine, for the maintainance of that Profession, besides other six Philosophicall and Mathematicall Bursers. Truly I have not imparted this to the Reader though Ostentation, but only that the baseness and impudencie of that fellow James Paterson may be known: and alio I be but a Student in the Colledge, yet I am not affraid to encounter with that Grand Mathematicall Impostour: For it is not strange to see one who wants truth on his side, make Lyes his refuge, but he may henceforth look for the common infelicity of Lyes, not to be believed, if he shall chance to stumble upon Truth. No more but that I am to all honest and ingenious Mathematicians

An Obedient Servant,

G. L.

Postsc. Let me have an answer of this against the middle of January at farthest, and not delay the same nine moneths as formerly; otherwise I will give a perfect solution of them my self in Print, against Candlemas.



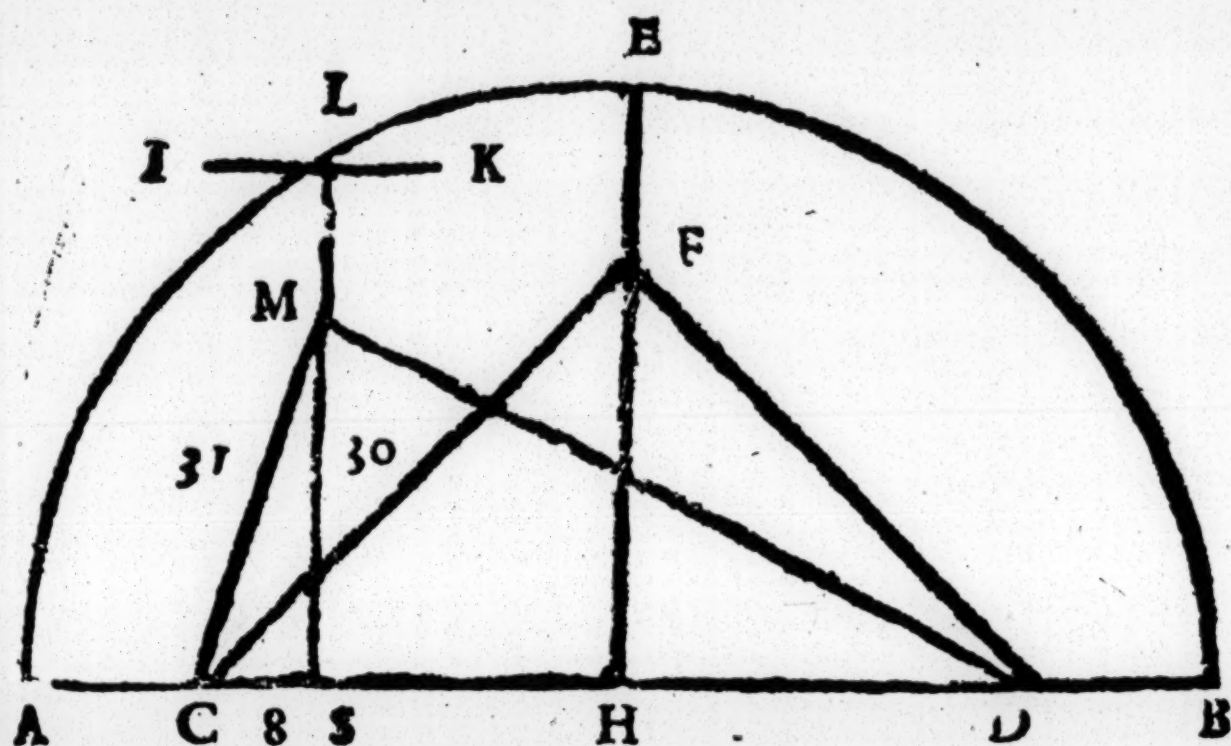
*Quinque Problemata, quae dicuntur
Iirocinia Nautica,
Insoluta, Solvenda.*

PROBLEM I.

There are two *Islands* in the parallel of 40 degrees, distant from each other 70 *Leagues*, a Ship, sailing from the *Westermost Island*, between the *N.* and *E.* doth meet with a Ship that had sailed from the *Eastermost*, between the *N.* and *W.* and they are both in the *Latitude* of 41 degrees 30 minutes, and these two Ships have sailed 100 *Leagues*, I demand by what *Courses* these two Ships have sailed? and how many *Leagues* in every particular *Course*?

I admit and accept of *Mr. John Kersey* his *Algebra* all solution as not from you, *quia ex tua Pharetra nunquam vixit talis Sagitta*, for this Gentleman was intimately acquainted with my Father at *London*; he being a teacher of the *Mathematicks* there three or four years before his *Majesties* happy restoration, so that by you I find no solution to the *Problem*, neither *Arithmetically* nor *Geometrically*: for if it had been so *Arithmetically*, why not then the two subsequent *Problems*, which ye have marked and ignorant

ly solved: therefore I thought it expedient to give you an *Geometricall solution* with its *Demonstration* as followeth.



Let A, B , be 100, and H, D , and H, C , each of them 35, so C, D , shall be 70: the *Square* of C, H , subtracted from the *Square* of C, F , the remainder is the *Square* of F, H , 1275; then say, as the *Square* of F, H , 1275, is to the *Square* of E, H , 2500, so the *Square* of 30 *Leagues*, or of 1 *deg.* 30 *min.* being 900 to a *Square* 1764, whose *Square-root* is 42, which being taken, draw a *Parallell* to A, B , (to wit, I, K , cutting the *Peripherie* in L , and from the *Peripherie* in L , let fall a *Perpend. parall.* to E, H , as L, S , and place 30 *Leagues* from S to M , then draw lynes from M to D , and from M to C , so shall S, H be 27, and C, S 8, therefore C, M 31, and M, D 69 *Leagues*, so that the course of the *Westermost Ship*

Ship at C is N. by E. 3 deg. 21 min. Easterly,
and for the Ship at D, her course was W. N.
W. 5 deg. 20 min. Northberly.

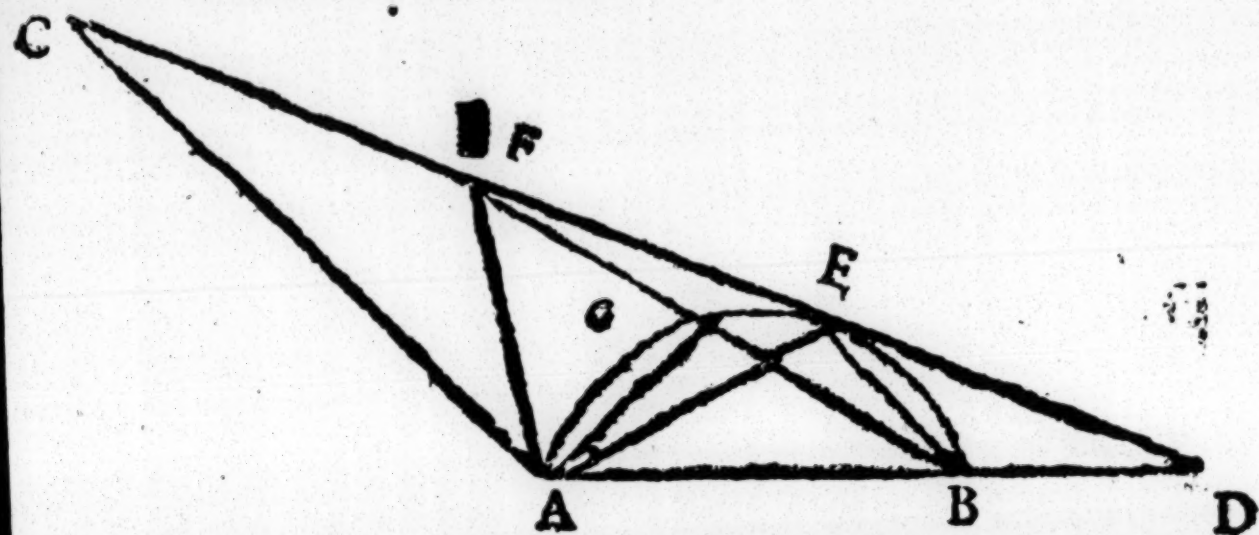
Demonst. Because as the *Rectang.* A H B : A
S B *Rectang.* :: Sq. of H F : Sq. of S M, the
Points of A M F B being in the same *Ellipsis*,
and because A C = D B and C F to F D and
equall to A B, the Points C D *erunt puncta ex*
comparatione facta, five Ellipsis foci: therefore
C M, & M D the sides are equall to the *Dia-*
meter A B. that is, to the sum of the sides. This
semiellipsis per quatuor puncta data, I leave to be
described by you, if you know the nature of an
Ellipsis. (*Consect*) From hence it followeth,
that in any right lynes oblique Triangle, having
the *Base*, and *Perpendicular*, with the sum of
the two sides, we may find both *Sides* and
Angles: but whereas you say, that this Propo-
sition is a foolish and ill propounded *Problem*,
because it is capable of two Answers, I say, it is
not foolish, nor ill propounded, because of the
two *focos*, which doth admit of two answers,
but here I take my answer from the *focos* C,
which could have been performed from the
focos D, *mutatis mutandis*.

PROBLEM II.

There are 3 Islands A, B, C, the Islands A and
B, in the paralleil of 40 degrees, and are distant
from each other 30 Leagues, the third Island C,
distant from A, 45 Leagues, and bearing of A,
North-West:

(9)

North-West : a Ship steering her Course *East-South-East* from C so long, till she cometh to the parallel of 40 degrees. I demand how far she hath sailed from the *Island* C, before she bring the two *Islands* A and B, *sub maximo Angulo*, or greatest Angle?



In the solution of this *Problem*, you have the *Sides* and *Angles* by *Trigonometric* found, as the *Angle* at C 22 deg. 30 min. as also, the *Angle* at D. A C and A D, each of them being 45 *Leagues*, with the *Angle* at A, 135 deg. the *Side* C D being 83 *Leagues*. Now to find how far the Ship shall sail from C, before she bring the two *Islands* A and B, *sub maximo Angulo*, it is not as my *Antagonist* says, that she is to sail from C to D; for then she brings the two *Islands* in a straight *Lyne*, which was not required; but a Point was to be found: from which two *Lines* being drawn, as E A, and E B, the two *Islands* E and B shall be seen *sub maximo Angulo*: for performance of which find a middle proportionall between A D, and

and B D, which shall be 25 , 58, so the Ship shall sail from C to E, 57 , 42 Leagues before she can bring the two Islands A and B, *sub maximo Angulo*.

Demonst. If by the (5 : 4 *Euc.*) a Circle being described about the Triangle A E B, it shall touch E D in E, by (37 : 3 *Euc.*) so shall A E B be the greatest Angle, which can be drawn from any Point in the Lyne C D : as admit, any other Point to be taken in the Lyne C D, as the Point F, then having drawn from F, the two Lynes F A, F B, the Lyne F B shall cut the Circle in G: The Angle A G B, is equal to the Angle A F B, (21 : 3 *Euc.*) but the Angle A G B, is greater then the Angle A F B, therefore the Angle A F B, is less then the Angle A G B, by (16 : 1 *Euc.*) And finally, the same may be said of all the Points in the Lyne C D, except onely at E, where A and B shall be seen, *sub maxime Angulo*: and so accordingly I have clearly demonstrated that a Point being taken in the Lyne C D, as at E, doth solve this Problem, which by James Paterson is not solved at all, wherein he is grossly mistaken by saying that there was no need in giving the distance between A and B 30 Leag. whereas the whole question is grounded upon the same.

PROBLEM III.

▲ Ship in the Latitude of 40 degrees, is bound
West-ward,

West-ward, and being at A, she setteth an Island B, bearing of her South, and keeping her Course West, being at C, she setteth the same Island bearing of her South by East 5 degrees Easterly. Again, being at D, South-South-East 4 degrees Easterly. Lastly, being at E, she setteth the same to bear of her South-East by South 6 deg. 15 min. Easterly: and hath sailed between D and E, 2 , 9 Leag. more then between C, and D. I demand how far B was distant from A, when bearing Southerly.

James Paterson is mightily troubled in finding the solution of this Problem, by placing many a plus and minus, to make the world believe that he hath solved the Question, whereas (*pariturunt montes, & nascitur ridiculus mus*) in saying, that the Island B bearing of A Southerly, was only distant 2 , 38 Leag (the distance of the Ship from the Island, when bearing Southerly) which was requy ed: whereas in truth, the Island B was distant from A, 13 , 3 L. as by this Analogie shall be apparent.

As Rad. : 29 : : Tang. 27 d. 30 m. : 15.

again, As 29 : 15 : : 258 : 13 , 3 L.

Here I have made use of Decimalls, because our Printer had not so small Types for Vulgar Fractions, and therefore I was forced to reduce Vulgar Fractions into Decimalls.

PROBLEM IV.

A Ship in the Latitude of 40 degrees, saileth
so

so long between the *North* and *East*, till she altereth her *Longitude* 10 degrees, and hath departed from her first *Meridian*, 96 *Leagues* 2 *Myles*: I demand how far she hath sailed? and by what Course? (solved.)

PROBLEM V.

Mr. Norwood, in his application of *Spherical Trigonometrie*, to the third kind of sailing, by the *Arch* of a great *Circle*, which is demonstrated by him, and others, to be the best way of sailing, (*Consideratis Considerandis*) Therefore supposing two *Places* or *Islands*, lying in the parallel of 60 degrees, distant from each other 20 degrees in *Longitude*, and there are two Ships the one sailing in the *Parallel*; the other upon the *Arch* of a great *Circle*: I demand whether or no, he that saileth upon the *Arch* of a great *Circle*, doth make a *major*, or, *minor ratio*, to the great *Circle*, then he that saileth upon the *Arch* of the *Parallel*, doth to the *Parallel* in which he saileth?

You assert in your *Almanack*, that there is a *minor ratio* between the *Arch* of a great *Circle*, and the great *Circle*; and consequently, a greater between the *Arch* of the *Parallel*, and the *Parallel*. The contrary of which I shall demonstrate, that the antecedent to its consequent hath a *major ratio*, whose *quotus* is *major*; but an *unit* being the antecedent, and 36 the consequent of the *Arch* of the great *Circle*, to the great

great Circle, hath a major ratio, then 1 to 18, the Arch of the Parallell to the Parallell. The which I make manifest from Dr. Wallis, as is demonstrated by him and others, upon the fifth book of *Euclid* Pag. 317. I do admire to see you so ignorant, in *rationum distributione*, as not to understand a major, or minor ratio in quantities given. Of all these five Problems James Paterfon with the help of Mr. Kersey, hath only solved two, the first *Arithmetically*, which was expected he should have solved both *Arithmetically*, and *Geometrically*; and the fourth which might have been solved by a Cabin boy of six weeks teaching into a Navigation School, therefore I see plainly by his solutions that he truly is, *Mathematicus nomine tenus*.

After this James Paterfon proceeds in such a strain, in the postscript of his *Almanack*, as would almost provoke Meekness its self to make a Satyre, but it is so pittyfull, that it cannot excuse a serious answer from being impertinent, in saying, in the *Steriographicall projection*, that in finding the Sides and Angles of an *Oblique Spherical Triangle* is a common thing, and clearly demonstrate by Mr. Newton's book upon the *Globs*, which assertion I plainly deny, by reason he makes no mention of (*Coniugali sub-contraria sectio*) upon which the whole *Steriographicall projection* doth depend. Neither hath he made mention of the *Orthographicall*

phicall projection, for then he had made mention of 5. Sec. *Coni Isosceles*, upon which the *Orthographicall projection* doth depend. (I will give him one *Querie*, which I hope he will solve either *Orthographicice* or *Steriographicice*, without the help of a *Sphericall calculation*, the *Poles Elevation* being given 57 deg the *Suns Declination* N. 18 deg the *Suns Altitude* 40 deg I demand *Orthographicice* & *Steriographicice*, the *Suns Angle of position*.) Afterward he having vapoured a little to no other purpose, then to display his pedantrie and discover his ignorance in the *Mathematicks*, he propounds *duo Enigmata*, or, if I may call them *entia rationis obiective tantum in intellectu*. therefore he shall have the common solution of such, which proves him a stranger to Learning, for if he had been a *Mathematician*, he had not proposed such.

ENIGMA I.

When shall the first *Star* of the *Rams South-Horn*, be first as far from its present place, as the bright *Star* in the *Rams fore-head* shall have *Declination* at the time enquired after.

I do believe, that fellow *Paterfon* desires to be taught herein, for he doth not know, whether or not there be a *Star* in the *Rams South-Horn* therefore I shall give him information, according to *Tycho* and *Regiomontanus*, who sheweth in their *Canons* there is no such *Star*, for if there had been any, they would have given the *Long*

and *Lat.* of the said *Star*: but if so be that he hath found out any new *Star*, in the *Rams South-Horn*, let him give the *Long.* and *Lat.* of the said *Star*, then it shall be called *Nova Stella*, according to his new found on *Longitude*.

ÆNIGMA II.

When shall all the *Planets* together with their *Nods*, be 1 in the same *degree* and *minute* of the *Ecliptick* (*Answer*.) *Ad Græcas Calendas*.

Now *James Paterson* having spent many of his *Spirits* for nine months together, in this tempestuous conflict of solving these five *Problems* he propons two *Ænigmas*, to the which I have given an answer, and having fallen a sleep, he dreams all the rest of them; but for to awake him from his drowsiness, I propons *quædam Problemata solvenda & demonstranda*.



Problem I. There is a *Plot* or *Parcel* of ground *A B C D*, surveyed and plotted containing 23 *Acres* 1 *R.* 24 *Pole*. I demand by what *Scale* of *perches* this *Area* was found. I desire that

that *Demonstrative & Geometrice* you perform the same, with all the subsequent *Problems*.

Prob. 2. There is a *Semicircle* whose *Diameter* being 1000 and in the same there is described a *Sector* whose *Base* upon the *Peripherie* doth contain 30 deg. I demand the *Area* of a *Segment* of that *Semi-Circle* with two straight *Lines* parallel to the *Diameter* equall to the *Sector*. *Const. & Demonst.*

Prob. 3. There is a right *Angled plain Triangle*, the difference of the *Sides* being 25, a middle proportionall between the *Sides* being 37. I demand the quantity of the *Sides*? *Const. Dem.*

Prob. 4. There is a *Sphere* or *Glob* as A, whose *Diameter* is 100, there is another *Glob* B, divyded into two *Segments*, parallel to the *Diameter*, the greater *Segment* being equall to the *Glob* A, the *Altitude* of the same *Segment* being 75. I demand the *Diameter* of that *Glob*? *Const. & Demonst.*

Prob. 5. There is a *Circle* in which the greater *Diameter* is given, and a *Point* in the same, I would know the lesser *Diameter* of an *Ellipsis*, which shall pass through the *Point* given. Again, both the *Diameters* being given, the greater and the lesser, I would know by what *Point* in the parallel of 40 the *Ellipsis* shall pass. This *Problem* hath great use in *Navigation*, and therefore to be solved *Arithmetically* and *Geometrically*.

F I N I S. pro tempore.